

**"FEE ADDRESS" INDICATION FORM**

To: MAIL STOP: M Fee Correspondence  
U.S. Patent & Trademark Office  
P.O. Box 1450  
Alexandria, VA 22313-1450

Please recognize as the "Fee Address," under the provisions of 37 CFR 1.363, the following address:

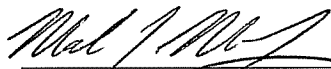
CPA GLOBAL NORTH AMERICA LLC  
2318 Mill Road  
12<sup>th</sup> Floor  
Alexandria, VA 22314

Payor Number: 000197

in the following listed application(s) or patent(s) for which the issue fee has been paid.

<u>Patent No.</u>	<u>Serial No.</u>	<u>Patent Date</u>	<u>Filing Date</u>	<u>Confirmation No.</u>	<u>Attorney Docket No.</u>
7,750,159	10/579,114	07/06/2010	05/11/2006	1511	0553-0499

Respectfully Submitted,



Mark J. Murphy  
Registration No. 34,225  
Date: February 28, 2011

Husch Blackwell LLP  
120 South Riverside Plaza  
Suite 2200  
Chicago, Illinois 60606  
(312) 655-1500

Customer No: 24628



US007750159B2

(12) **United States Patent**  
**Nomura et al.**

(10) **Patent No.:** **US 7,750,159 B2**  
(45) **Date of Patent:** **Jul. 6, 2010**

(54) **PHENANTHROLINE DERIVATIVE AND  
LIGHT EMITTING ELEMENT AND LIGHT  
EMITTING DEVICE USING THE SAME**

(75) Inventors: **Ryoji Nomura, Kanagawa (JP); Daisuke  
Kumaki, Nigata (JP)**

(73) Assignee: **Semiconductor Energy Laboratory  
Co., Ltd. (JP)**

(\*) Notice: Subject to any disclaimer, the term of this  
patent is extended or adjusted under 35  
U.S.C. 154(b) by 148 days.

(21) Appl. No.: **10/579,114**

(22) PCT Filed: **Jun. 29, 2005**

(86) PCT No.: **PCT/JP2005/012436**

§ 371 (c)(1),  
(2), (4) Date: **May 11, 2006**

(87) PCT Pub. No.: **WO2006/004138**

PCT Pub. Date: **Jan. 12, 2006**

(65) **Prior Publication Data**

US 2007/0145353 A1 Jun. 28, 2007

(30) **Foreign Application Priority Data**

Jul. 7, 2004 (JP) ..... 2004-200059

(51) **Int. Cl.**  
**C07D 471/02** (2006.01)  
**H01L 51/50** (2006.01)

(52) **U.S. Cl.** ..... **546/49; 428/690; 428/917;**  
313/506

(58) **Field of Classification Search** ..... **546/49;**  
428/917, 690; 313/506

See application file for complete search history.

(56) **References Cited**

**U.S. PATENT DOCUMENTS**

5,393,614 A 2/1995 Nakada ..... 428/690  
2004/0265626 A1 12/2004 Shibamura et al. .... 428/690

# FOREIGN PATENT DOCUMENTS

EP	0 564 224	10/1993
EP	1 097 980	5/2001
JP	05-331459	12/1993
JP	2001-131174	5/2001
JP	2003-017268	1/2003
JP	2004-107263	4/2004
JP	2004-175691	6/2004
JP	2005-108720	4/2005
WO	WO 2004/026870	4/2004

# OTHER PUBLICATIONS

International Search Report re application No. PCT/JP2005/012436,  
dated Aug. 30, 2005.

Written Opinion re application No. PCT/JP2005/012436, dated Aug.  
30, 2005.

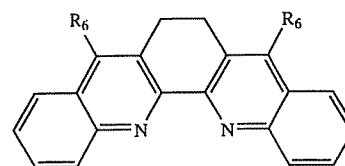
*Primary Examiner*—Charanjit S Aulakh

(74) *Attorney, Agent, or Firm*—Husch Blackwell Sanders  
LLP

# (57) ABSTRACT

It is an object of the present invention to provide a novel  
material that can be used for an electron injecting material. In  
addition, it is an object of the present invention to provide a  
light-emitting element that is able to broaden choices for an  
electrode material.

An aspect of the present invention is an electron injecting  
material represented by a general formula (2). In the general  
formula (2), R<sub>6</sub> is selected from the group consisting of an  
alkyl group having 1 to 4 carbon atoms, an alkenyl group  
having 1 to 4 carbon atoms, and an aryl group having 6 to 10  
carbon atoms, where the alkenyl group and the aryl group  
may have a substituent.



(2)

**10 Claims, 12 Drawing Sheets**